Ordering number : EN5118A

Monolithic Linear IC



No. 5118A

LA7440, 7440M

Video Signal Processing IC for VHS VCR Systems

Overview

The LA7440, 7440M is a video signal processing single-chip IC that, except for the VHS format VCR SECAM chrominance signal, handles the PAL-G, B, I M and N, NTSC-M, 4.43 NTSC, MESECAM and NAP-G, B, I, M and N formats. IC internal trimming is used to make the LA7440, 7440M is completely adjustment free, and in combination with a special-purpose CCD (the LC89971, 89971M) it provides a significant reduction in external components, including the glass delay line. Thus the LA7440, 7440M can significantly reduce the signal processing board manufacturing costs. Furthermore, the LA7440, 7440M supports the NAP format (NTSC to PAL conversion) that is poised to become widespread in Europe, China and other markets.

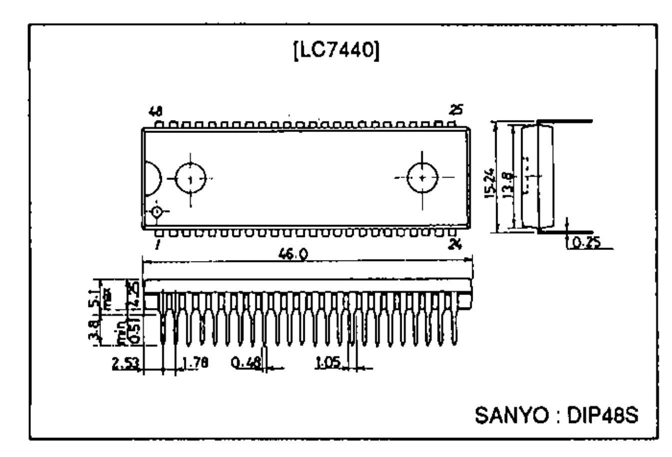
Features

- Completely adjustment free
  The AGC, carrier, deviation, and PB-Y level are adjustment free.
  The YC record current can also be made adjustment free by using the LA7411, 7416 as the head amplifier.
- Support for NAP and PAL color array correction
  Full modulation using a balanced modulator allows playback and conversion to PAL format of NTSC signals recorded on tape.
- Crosstalk exclusion in combination with a special-purpose CCD
  Crosstalk can be excluded without using a glass delay line by combining the LA7440, 7440M with a special-purpose CCD (the LC89971, 89971M).
- Minimal number of external components
  New built-in components:
  — Detail enhancer CR
  — C-trap in the Y low-pass filter
  — Crystal selector switch
  — Playback C low-pass filter
- High performance and multiple functions
  Linear phase picture controller
  Double high-pass noise canceller, high-speed AFC, DCC
  New built-in functions
  — NAP circuit
  — AVNS (advanced vertical noise suppresor)
  — Automatic QH insertion
  — FM AGC
- Miniature package (48-pin QIP or DIP)

Package Dimensions

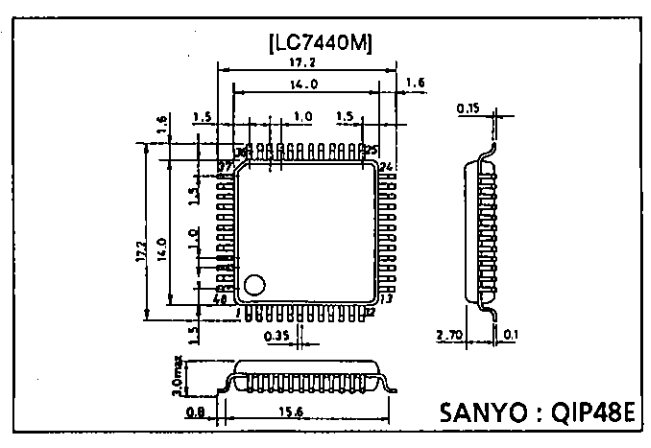
unit: mm

3149-DIP48S



unit: mm

3156- QIP48E



Functions

All VHS format VCR signal processing functions

	Luminance	Chrominance
R/P	Video amp. Feedback clamp Main LPF YNR (AVNS) VCA Sync separator 4.2 V regulator	3.58 BPF/4.43 BPF ACC amp. ACC det. Main converter 1.3 M LPF VXO/XO Side lock det. 3rd lock protector Half H killer BGP generator Killer det. VCO Phase shifter Sub converter 4.21/5.06BPF
REC	Video AGC amp. Video AGC det. Pre LPF Detail enhancer 1/2 f_H carrier shift NL emphasis Main emphasis White/dark clip FM modulator	Pre amp. Burst emphasis (NTSC) Killer APC det. AFC det. Burst gate amp.
PB	FM AGC amp. FM AGC det. Double limiter FM demodulator Sub LPF Double high pass noise canceller QV/QH/character insert Main de-emphasis DOC Drop out det. NL de-emphasis Picture control Y/C mix	Pre amp. Burst de-emphasis (NTSC) PB amp. Killer NAP PAL burst sequence – Compensator Carrier balancer Burst gate amp. APC det. ID det. DCC Trick det. DPLL

Specifications

Pin numbers are for the LA7440M

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		7.0	V
Allowable power dissipation	Pd max	LA7440	1150	mW
		LA7440M: Ta ≤ 65°C*	1350	mW
Operating temperature	Topr		–10 to +65	°C
Storage temperature	Tstg		–40 to +150	°C

Note: * When mounted on a 70 mm by 65 mm, 1.5 mm thickness Bakelite board. The value for the DIP package is 1150 mW.

Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		5.0	V
Operating supply voltage	V_{CC} op		4.8 to 5.2	V

Operating Characteristics at Ta = 25°C, V_{CC} = 5.0 V

Parameter	Symbol	Conditions	min	typ	max	Unit
[Record Mode Y System]						
Record mode current drain	I_{CCR}	Input: 1.0 Vp-p video signal	100	130	160	mA
EE output level 1	$V_{EE}1$	Input: 50 Hz system 1.0 Vp-p video signal	1.95	2.05	2.15	Vp-p
EE output level 2	$V_{EE}2$	Input: 60 Hz system 1.0 Vp-p video signal	1.95	2.05	2.15	Vp-p
AGC characteristics 1	AGC1	Input: 50 Hz system 2.0 Vp-p video signal	2.05	2.15	2.25	Vp-p
AGC characteristics 2	AGC2	Input: 50 Hz system 0.5 Vp-p video signal	1.90	2.00	2.10	Vp-p
AGC characteristics 3	AGC3	Input: 50 Hz system with only SYNC increased 6 dB	555	615	695	mVp-p
AGC characteristics 4	AGC4	Input: 50 Hz system with only SYNC decreased 6 dB	370	410	450	mVp-p
Sync separator output level	V_{SYR}	The SYNC-OUT output pulse wave height	3.9	4.1	4.3	V
Sync separator output pulse width	PW_{SYR}	The SYNC-OUT output pulse width	4.0	4.3	4.6	µs
Sync separator output pre-record delay time	ΔT_{SYR}	The SYNC-OUT delay time	0.9	1.1	1.3	µs
Sync separator threshold level	TH_{SYR}			–20	–15	dB

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Parameter	Symbol	Conditions	min	typ	max	Unit
[Record Mode Y System]						
Pseudo-H insertion level	ΔHD_R	With 2.7 V applied to T14A	–400	–300	–200	mV
White insertion level	ΔWH_R	With 1.3 V applied to T14A	100	250	400	mV
VCA detection voltage	V_{VCA}		3.00	3.20	3.40	V
Record YNR operation EP/LP	$V_{R\text{-}YNR1}$	Input: 50 Hz system standard color bar signal	10	12	14	mVp-p
Y-LPF frequency characteristics 1	YLPF1	The 1 MHz attenuation with respect to 500 kHz; 3.58 system	–0.5	0.0	+0.5	dB
Y-LPF frequency characteristics 2	YLPF2	The 2 MHz attenuation with respect to 500 kHz; 3.58 system	–1.0	0.0	+1.0	dB
Y-LPF frequency characteristics 3	YLPF3	The 3 MHz attenuation with respect to 500 kHz; 3.58 system	–9	–7	–5	dB
Y-LPF frequency characteristics 4	YLPF4	The 3.58 MHz attenuation with respect to 500 kHz; 3.58 system			–25	dB
Y-LPF frequency characteristics 5	YLPF5	The 4.2 MHz attenuation with respect to 500 kHz; 3.58 system			–15	dB
Y-LPF frequency characteristics 6	YLPF6	The 4.43 MHz attenuation with respect to 500 kHz; 4.43 system			–25	dB
FM modulator output level	V_{FM}	No input	1.0	1.2	1.4	Vp-p
Carrier frequency 1	F_{FM1}	50 Hz system	3.7	3.8	3.9	MHz
Carrier frequency 2	F_{FM2}	60 Hz system	3.3	3.4	3.5	MHz
FM modulator output 2nd harmonic distortion	H_{MOD}			–40	–35	dB
Deviation 1	DEV1	50 Hz system	0.95	1.00	1.05	MHz
Deviation 2	DEV2	60 Hz system	0.95	1.00	1.05	MHz
FM modulator linearity	L_{MOD}		–2	0	+2	%
1/2 f_H carrier shift	CS		6.5	7.8	9.1	kHz
Emphasis gain	G_{EMP}	Input: 0.5 Vp-p, 10 kHz sine wave	–0.5	0.0	+0.5	dB
Detail enhancer characteristics 1	G_{DET1}	Input: 158 mVp-p, 2 MHz sine wave	1.6	1.9	2.6	dB
Detail enhancer characteristics 2	G_{DET2}	Input: 50 mVp-p, 2 MHz sine wave	3.1	4.1	5.1	dB
Detail enhancer characteristics 3	G_{DET3}	Input: 15.8 mVp-p, 2 MHz sine wave	5.3	6.3	7.3	dB
NL emphasis characteristics 1	G_{NLEMP1}	Input: 500 mVp-p, 2 MHz sine wave	0.5	1.4	2.3	dB
NL emphasis characteristics 2	G_{NLEMP2}	Input: 158 mVp-p, 2 MHz sine wave	2.6	3.8	5.2	dB
NL emphasis characteristics 3	G_{NLEMP3}	Input: 50 mVp-p, 2 MHz sine wave	4.9	6.4	7.9	dB
Main emphases characteristics 1	G_{ME1}	Input: 100 mVp-p, 500 kHz sine wave	4.9	5.2	5.5	dB
Main emphases characteristics 2	G_{ME2}	Input: 100 mVp-p, 2 MHz sine wave	13.1	13.6	14.1	dB
White clipping level	L_{WC}	Input: 1.0 Vp-p, white 100% video signal	186	195	204	%
Dark clipping level	L_{DC}	Input: 1.0 Vp-p, white 100% video signal	–55	–50	–45	%
[Playback Mode Y System]						
Playback mode current drain	I_{CCP}		135	160	185	mA
Dropout compensation time	T_{DOC}		0.72	0.85	0.98	ms
DOC loop gain	G_{DOC}	5H later	–1.0	0.0	+1.0	dB
Playback Y level	V_{VOUT}	For playback of an FM signal with a 1.0 MHz deviation	1.95	2.05	2.15	Vp-p
FM demodulator linearity	L_{DEM}	2, 4, 6 MHz	–3.5	0.0	+3.5	%
Demodulation sensitivity	S_{DEM}		0.47	0.52	0.57	V/MHz
Carrier leakage	CL	Input: 4 MHz, 600 mVp-p		–40	–35	dB
Playback YNR characteristics LP/EP	$G_{P\text{-}YNR1}$	Input: 50% white + CW	–2.5			dB
NL de-emphasis characteristics 1	G_{NLDE1}	Input: 158 mVp-p, 2 MHz sine wave	–6.0	–5.0	–4.0	dB
NL de-emphasis characteristics 2	G_{NLDE2}	Input: 50 mVp-p, 2 MHz sine wave	–10.5	–9.0	–7.5	dB
Double noise canceller characteristics 1	G_{WNC1}	Input: 158 mVp-p, 2 MHz sine wave	–2.3	–1.8	–1.3	dB
Double noise canceller characteristics 2	G_{WNC2}	Input: 50 mVp-p, 2 MHz sine wave	–6.0	–5.0	–4.0	dB
Double noise canceller characteristics 3	G_{WNC3}	Input: 15.8 mVp-p, 2 MHz sine wave	–10.5	–9.0	–7.5	dB
PIC-CTL hard response characteristics 1	G_{PH1}	Input: 50% video + sine wave f = 1 MHz, 158 mVp-p	4.5	5.5	6.5	dB

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Parameter	Symbol	Conditions	min	typ	max	Unit
[Record Mode Y System]						
PIC-CTL hard response characteristics 2	G_{PH2}	Input: 50% video + sine wave f = 2 MHz, 158 mVp-p	8.0	9.0	10.0	dB
PIC-CTL soft response characteristics 1	G_{PS1}	Input: 50% video + sine wave f = 1 MHz, 158 mVp-p	–4.5	–3.5	–2.5	dB
PIC-CTL soft response characteristics 2	G_{PS2}	Input: 50% video + sine wave f = 2 MHz, 158 mVp-p	–9.0	–7.0	–5.0	dB
Pseudo-V insertion level (playback)	ΔVD_P	With 5 V applied to T14A	–150	–50	+50	mV
Pseudo-H insertion level (playback)	ΔHD_P	With 2.7 V applied to T14A	–400	–300	–200	mV
White insertion level (playback)	ΔWH_P	With 1.3 V applied to T14A	100	250	400	mV
Sync separator output level	V_{SYP}	The SYNC-OUT output pulse wave height	3.9	4.1	4.3	V
Sync separator output pulse width	PW_{SYP}	The SYNC-OUT output pulse width	4.2	4.5	4.8	µs
Sync separator output prerecord delay time	ΔT_{SYP}		1.4	1.6	1.8	µs
4.2 V regulator voltage	V_{REG}		4.0	4.2	4.4	V
[Record Mode Chrominance System]						
Chrominance low band conversion output burst level	$V_{OR\text{-}38}$	Input: PAL/GBI standard color bar signal, 1 Vp-p	150	190	230	mVp-p
Burst enhancement level	G_{BE}	Input: NTSC standard color bar signal, 1 Vp-p, SP/EP	5.5	6.0	6.5	dB
VXO oscillator level 1	$V_{VXO\text{-}R1}$	Input: NTSC standard color bar signal, 1 Vp-p	300	500	700	mVp-p
VXO oscillator level 2	$V_{VXO\text{-}R2}$	Input: PAL/GBI standard color bar signal, 1 Vp-p	300	500	700	mVp-p
Record ACC characteristics 1	$ACC_{\text{-}R1}$	With only the chrominance signal level increased 6 dB		+0.2	+0.6	dB
Record ACC characteristics 2	$ACC_{\text{-}R2}$	With only the chrominance signal level decreased 6 dB	–0.5	–0.1		dB
ACC killer on input level	$V_{ACCK\text{-}ON}$			–26		dB
ACC killer on output level	$V_{O\text{-}ACCK}$			–60	–50	dB
ACC killer recovery input level	$V_{ACCK\text{-}OFF}$			–20		dB
VXO control sensitivity	S_{VXO}		1.3	3.2	5.1	Hz/mV
APC pull-in range 1	Δf_{APC1}		350			Hz
APC pull-in range 2	Δf_{APC2}				–350	Hz
BGP delay time	t_D	Input: PAL/GBI standard color bar signal, 1 Vp-p	3.1	3.4	3.7	µs
BGP pulse width	t_W		4.7	4.9	5.1	µs
AFC pull-in range 1	Δf_{AFC1}		+1.0	+7.0		kHz
AFC pull-in range 2	Δf_{AFC2}			–3.7	–1.0	kHz
YC separation capability (NTSC)	V_{OR25}	Input: 50% white + 3.571678 MHz			–20	dB
[Playback Mode Chrominance System]						
Video output burst level	$V_{OP\text{-}11}$	SP mode, input: burst 30 mVp-p	255	300	345	mVp-p
Pin 25 output burst level	$V_{OP\text{-}25}$	SP mode, input: burst 30 mVp-p	195	230	265	mVp-p
Playback ACC characteristics 1	$ACC_{\text{-}P1}$	With the chrominance level increased 6 dB		+0.5	+0.8	dB
Playback ACC characteristics 2	$ACC_{\text{-}P2}$	With the chrominance level decreased 6 dB	–0.8	–0.5		dB
Playback killer on input level	$V_{ACK\text{-}P}$		–40	–32	–25	dB
Playback killer on chrominance output level	$V_{OACK\text{-}P}$			–44	–40	dB
Main converter carrier leakage	C_{LP}	The 5.06 MHz carrier leakage component		–40	–33	dB
Burst deemphasis level NT	G_{BD}	NTSC mode	–5.25	–5.0	–4.75	dB
Playback XO output level 1	$V_{XO\text{-}P1}$		300	450	600	mVp-p
Playback XO output level 2	$V_{XO\text{-}P2}$		300	450	600	mVp-p
Playback XO oscillator frequency deviation	Δf_{XO}	$\Delta fXO = f - 4.433619$ (MHz)	–9	0	+9	Hz
SLD detector current 1	I_{SLD1}			170		µA
SLD detector current 2	I_{SLD2}			170		µA
NTSC playback burst output level	V_{BNT}	NTSC mode	255	300	345	mVp-p
NTSC to PAL conversion - V axis burst level	VB-NAP		–1.0	0.0	+1.0	dB
NTSC to PAL conversion burst level ratio	ΔB-NAP		–2.0	0.0	+2.0	dB

L7440M Control Pin Table

Pin No.		Control function	L	M	H
3	R/P	Edit			3.8 VDC or more
5	R/P	YNR (AVNS)-CTL	1.0 VDC to less YNR-off	1.5 to 2.5 VDC YNR-CTL	3.5 VDC or more YNR (strong)
6	R	******			3.9 VDC or more
	P	N. C. CTL	1.5 VDC or less N. C-off	2.0 to 3.0 VDC N. C-CTL	
12	R/P	C-rotary	0 to 1.9 VDC Low CH	2.3 VDC or more High CH	
14	P	QV/QH CHARA. INS	0.8 VDC or less Through 1.2 to 2.2 VDC CHARA insert	2.6 to 3.3 VDC Pedestal insert	3.7 VDC or more QV insert
15	P	Auto QH INS on	Pull down by 3.9 kΩ		
18	R/P	E-M/M	1.6 V or less E-M (50 Hz)	2.0 V or more M (60 MHz)	
		N. L.-on (weak)	0.6 VDC or less N. L.-off	1.0 to 3.0 VDC N. L.-on	3.9 VDC or more N. L.-off
	R	Detail-ENHA	Normal	Weak and f_C down	Normal
22	R/P	EP/LP/SP	1.2 VDC or less SP	2.0 to 2.7 VDC LP	3.9 VDC or more EP
23	R	SP carrier shift stop			3.0 VDC or more SP carrier shift stop
24	P	NAP	1.2 VDC or less Through	2.0 to 2.7 VDC Balanced-mod output	3.3 VDC or more NAP-on
26	R/P	NT/MESEC/PAL	1.2 VDC or less PAL	2.0 to 2.7 VDC MESEC	3.9 VDC or more NTSC
29	P	Trick			3.9 VDC or more
35	R/P	Filter-change	2.0 VDC or less	3.0 VDC or more	
44	P	DOC-off			4.1 VDC or more
48	R/P	PB-H			4.0 VDC or more

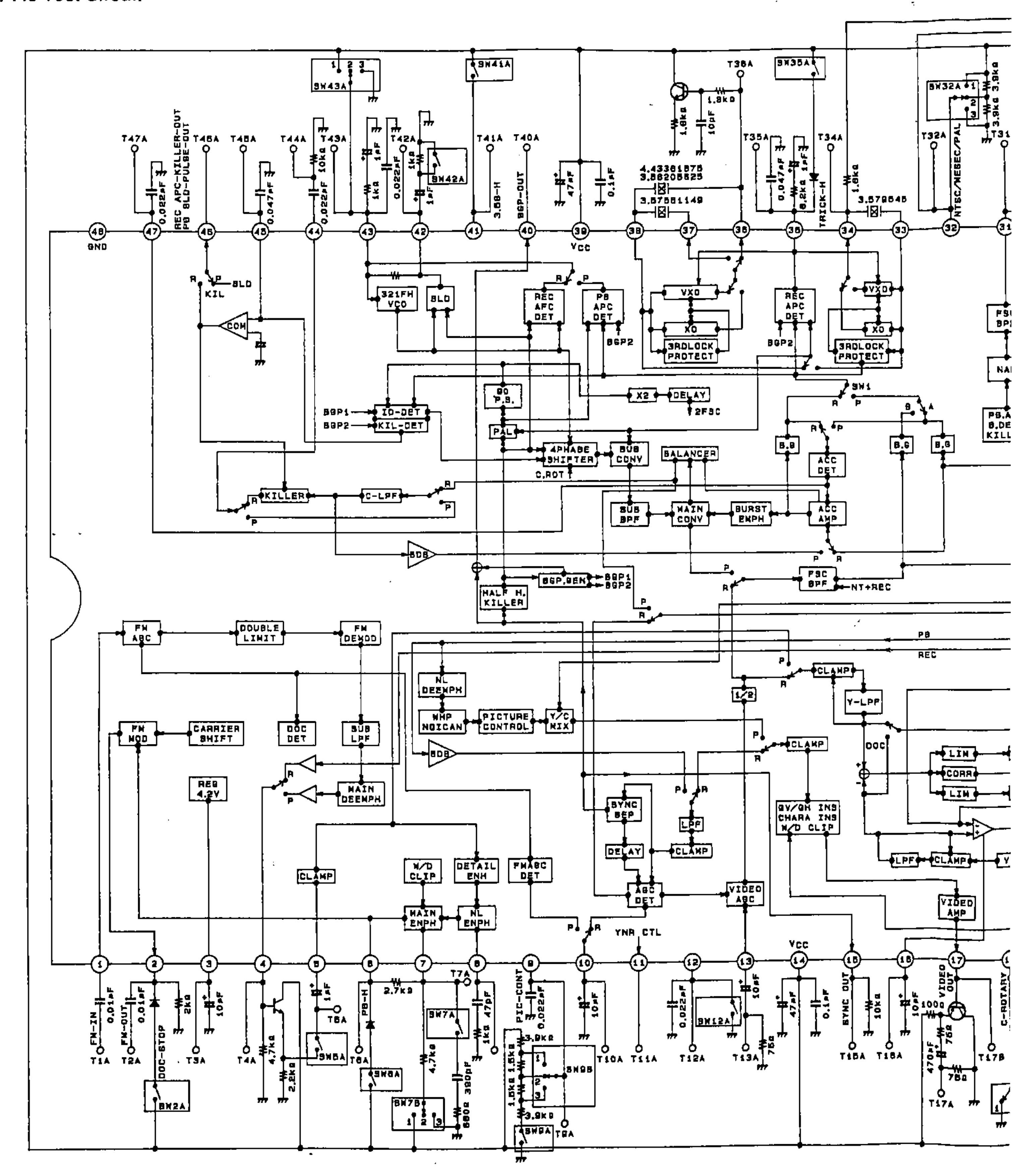
Note: Do not allow pin 3 to fall under 1.5 V. (The chip will enter test mode.)

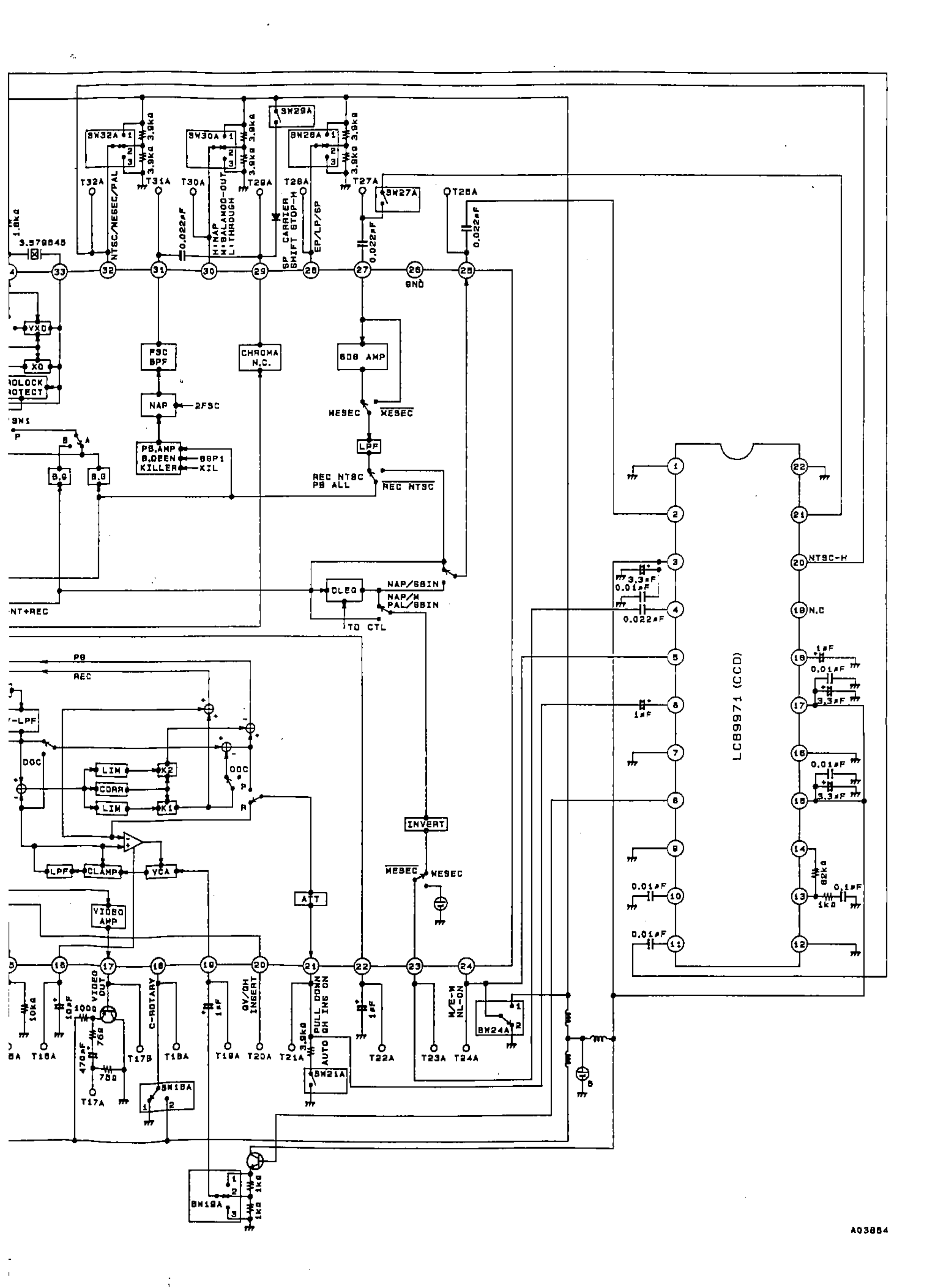
Function Control in each of the LA7440M Operating Modes

		Edit	YNR			NL		Detail enhancer			NC			PIC-CTL	1/2 f_H carrier shift
			Pin 5 control			Pin 18 control		Pin 6 control (with pin 18 control L/H)			Pin 6 control				
			L	M	H	L/H	M	L	M	H	L	M	H		
REC	SP	On	Off	Off	Off	Off	On	Off	Variable	Center	—	—	—	—	O (X)
		Off	Off	Off	Off	Off	On	Off	Variable	Center	—	—	—	—	O (X)
	LP EP	On	Off	K1 = 0.2 K2 = 0.0	K1 = 0.2 K2 = 0.0	On	On	Off	Variable	Center	—	—	—	—	O
		Off	Off	K1 = 0.5 K2 = 0.0	K1 = 0.5 K2 = 0.0	On	On	Off	Variable	Center	—	—	—	—	O
PB	SP	On	K1 = 0.0 K2 = 0.0	K1 = 0.0 K2 = 0.0	K1 = 0.5 K2 = 0.0	Off	On	—	—	—	Off	Variable	Center	Center	—
		Off	K1 = 0.0 K2 = 0.0	K1 = 0.2 K2 = 0.0	K1 = 0.5 K2 = 0.0	Off	On	—	—	—	Off	Variable	Center	O	—
	LP EP	On	K1 = 0.0 K2 = 0.5	K1 = 0.2 K2 = 0.5	K1 = 0.5 K2 = 0.5	On	On	—	—	—	Off	Variable	Center	Center	—
		Off	K1 = 0.0 K2 = 0.5	K1 = 0.2 K2 = 0.5	K1 = 0.5 K2 = 0.5	On	On	—	—	—	Off	Variable	Center	O	—

Note: 1. K1 is the YNR coefficient, K2 is the LNC coefficient
2. Use the 1/2 f_H carrier shift entries in parentheses when pin 23 is high.
3. The detail enhancer is off when pin 18 is at the middle level.

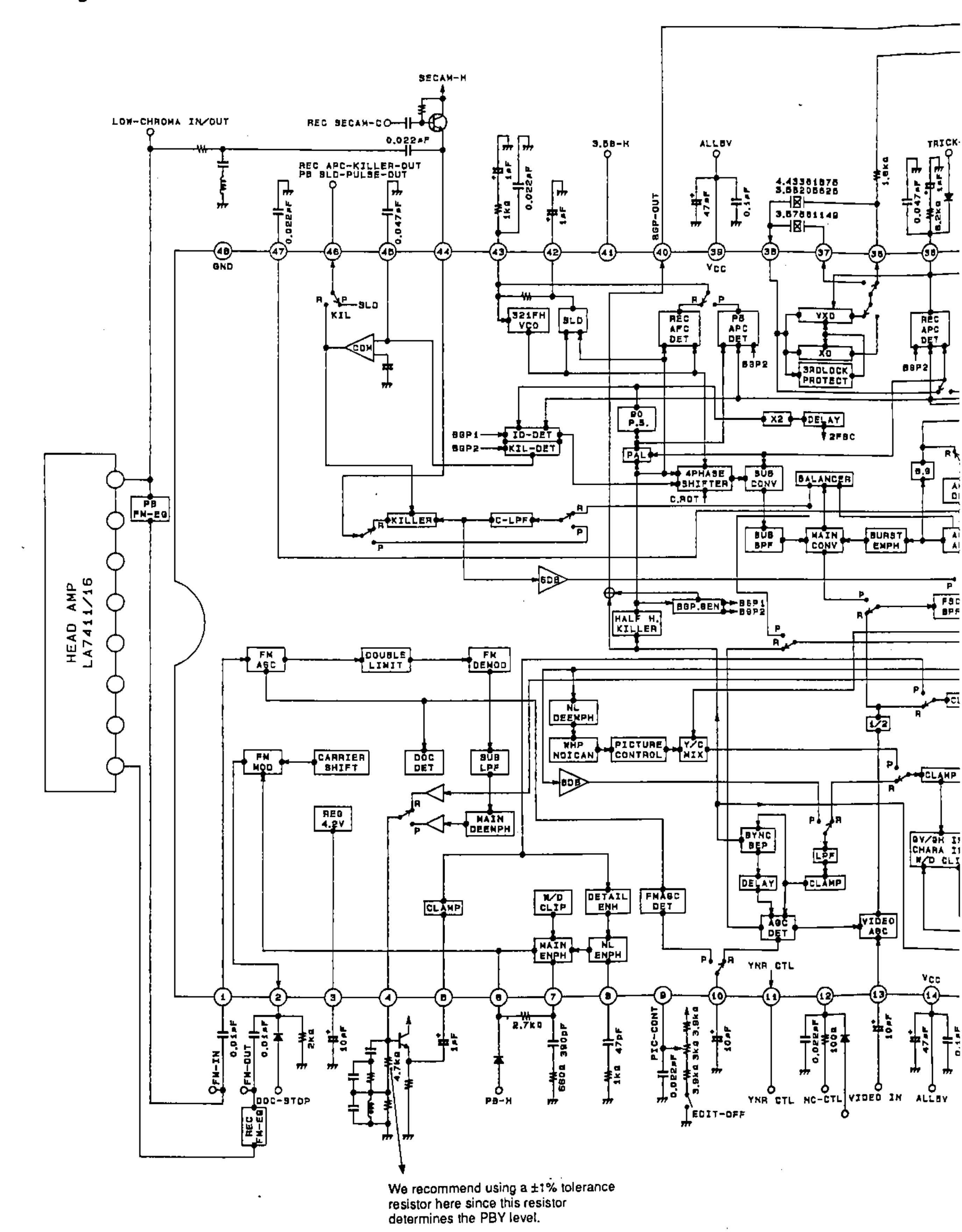
LA7440 Test Circuit



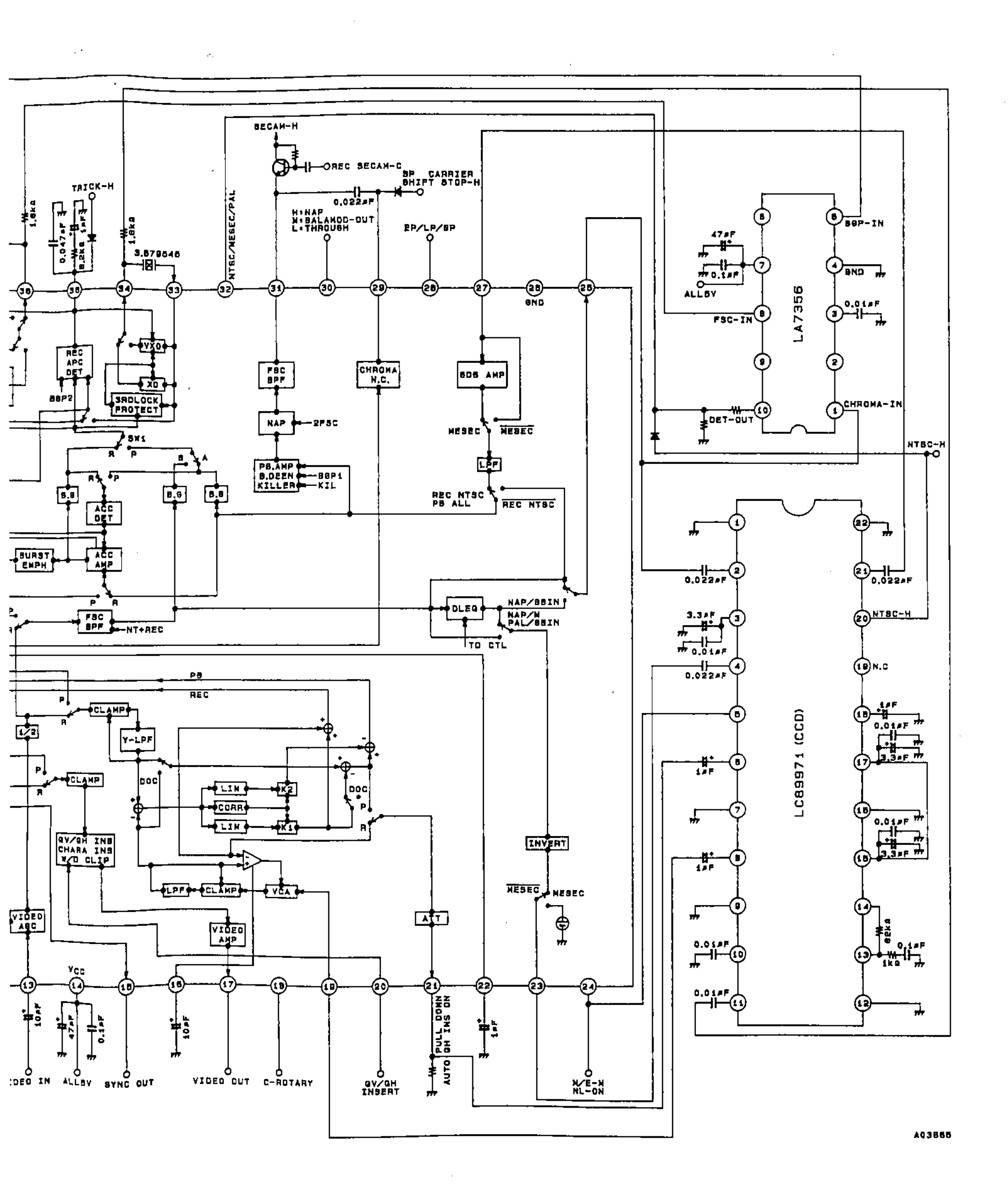


SW32A
SW30A
SW29A
SW28A
SW27A
3.9kΩ
T32A
T31A
T30A
T29A
T28A
T27A
T25A
NTSC/MESEC/PAL
H:NAP
M:BALANCE-OUT
L:THROUGH
SP CARRIER
SHIFT STOP-H
EP/LP/SP
0.022μF
3.579545
33
32
31
30
29
28
27
26
25
GND
VXO
XO
FSC BPF
NAP
2FSC
CHROMA N.C.
SGS AMP
MESEC
MESEC
LPF
REC NTSC
PB ALL
REC NTSC
PB.AMP
B.DEEN
KILLER
SBP1
KIL
B.G
DLEQ
NAP/SBIN
NAP/M
PAL/SBIN
TO CTL
NT+REC
PB
REC
DOC
LIM
CORR
K1
K2
LPF
CLAMP
VCA
VIDEO AMP
INVERT
ATT
16
17
18
19
20
21
22
23
24
10kΩ
10μF
VIDEO OUT
C-ROTARY
1μF
QV/QH INSERT
PULL DOWN
QH INS ON
AUTO
W/E-W NL-ON
T16A
T17B
T18A
T19A
T20A
T21A
T22A
T23A
T24A
T17A
75Ω
470μF
SW18A
SW21A
SW24A
SW19A
1kΩ
LC89971 (CCD)
NTSC-H
N.C
3.3μF
0.01μF
0.022μF
1μF
82kΩ
0.1μF
A03864

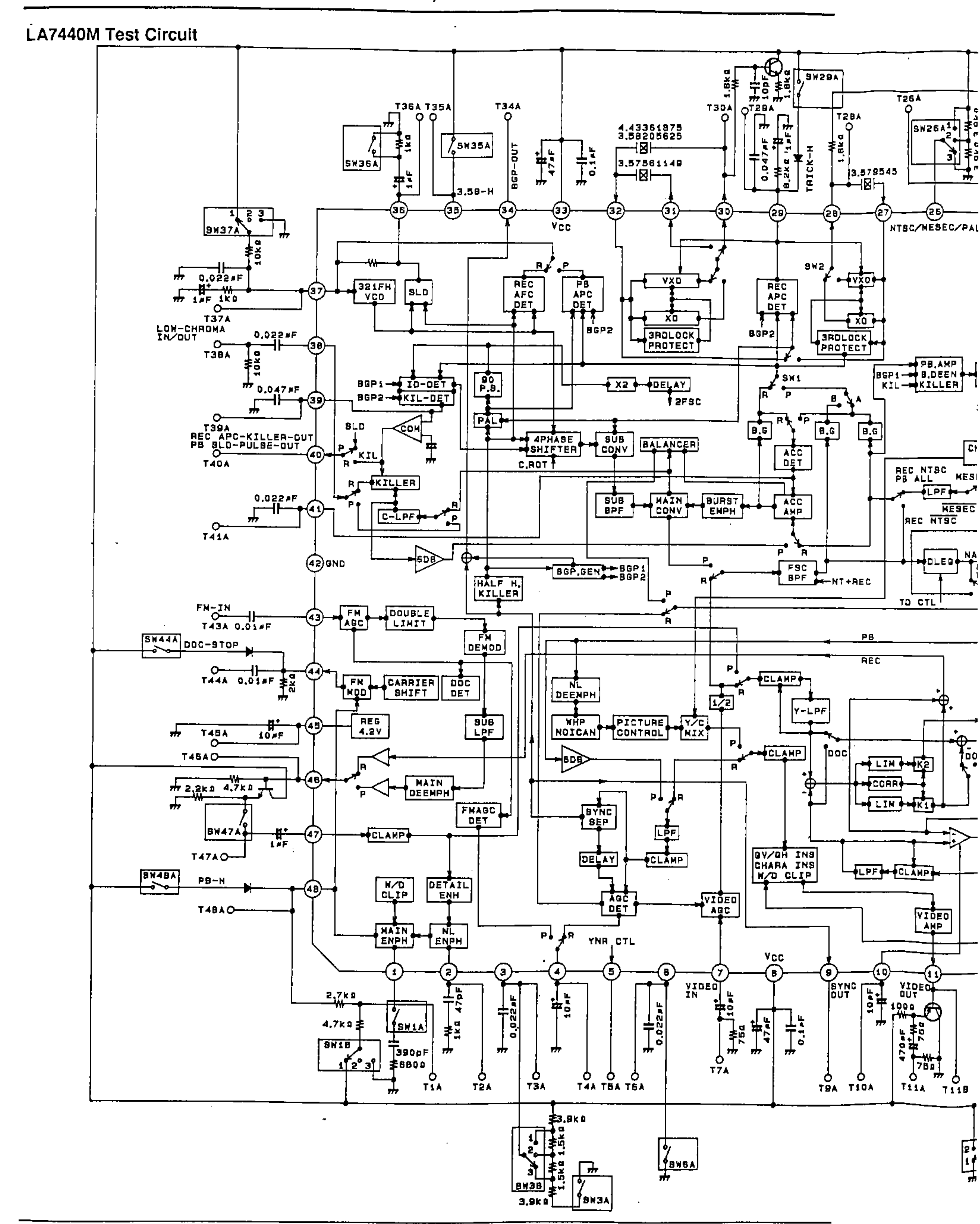
LA7440 Block Diagram

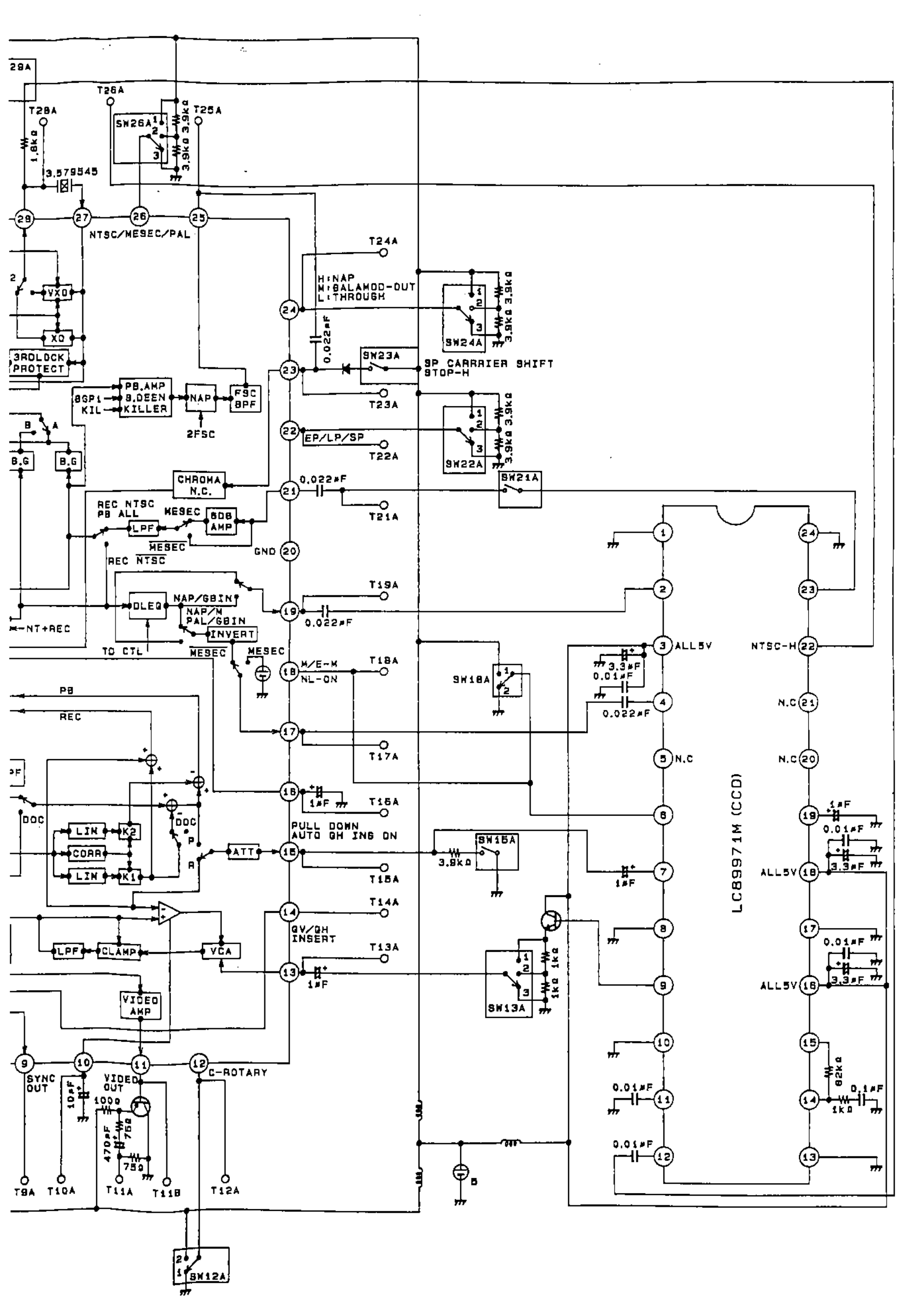


We recommend using a ±1% tolerance resistor here since this resistor determines the PBY level.


SECAM-H
REC SECAM-C
SP CARRIER
SHIFT STOP-H
TRICK-H
0.022μF
H:NAP
M:BALAMOD-OUT
L:THROUGH
SP/LP/EP
NTSC/MESEC/PAL
3.579545
GND
REC APC DET
VXO
XO
3RDLOCK PROTECT
FSC BPF
NAP
2FSC
PB.AMP B.DEEN KILLER
BGP1
KIL
CHROMA N.C.
SDS AMP
MESEC
LPF
REC NTSC PB ALL
REC NTSC
SW1
ACC DET
ACC AMP
BURST EMPH
NT+REC
DLEQ
NAP/SSIN
NAP/M PAL/SSIN
TO CTL
PB
REC
CLAMP
Y-LPF
DOC
LIM
CORR
K1
K2
QV/QH INS CHARA INS W/D CLIP
VIDEO AGC
VIDEO AMP
VCA
ATT
INVERT
LA7356
BGP-IN
GND
ALL5V
FSC-IN
DET-OUT
CHROMA-IN
NTSC-H
LC89971 (CCD)
N.C
VIDEO IN
ALL5V
SYNC OUT
VIDEO OUT
C-ROTARY
QV/QH INSERT
PULL DOWN QH INS ON AUTO
M/E-M NL-ON
A03665

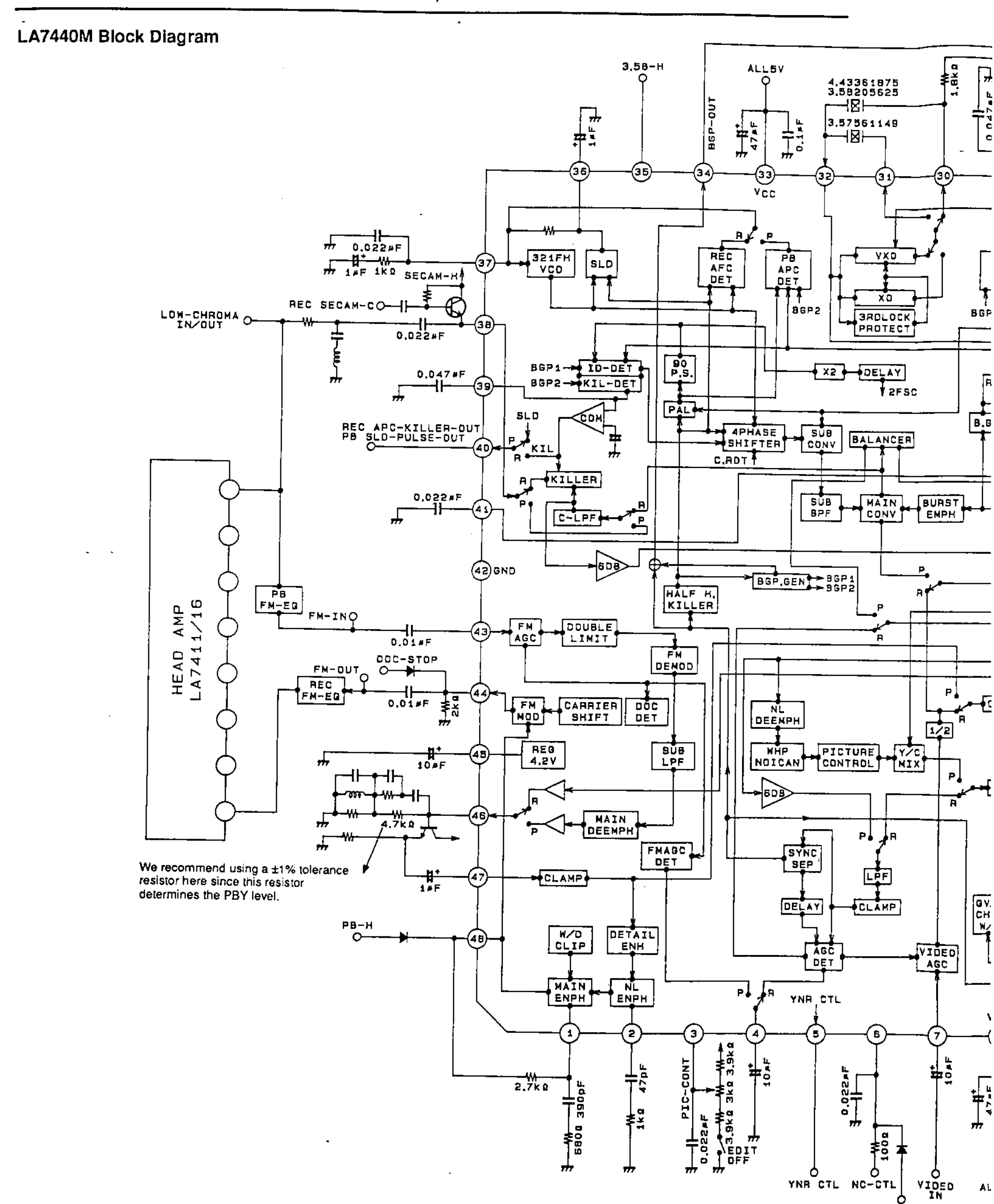
LA7440M Test Circuit

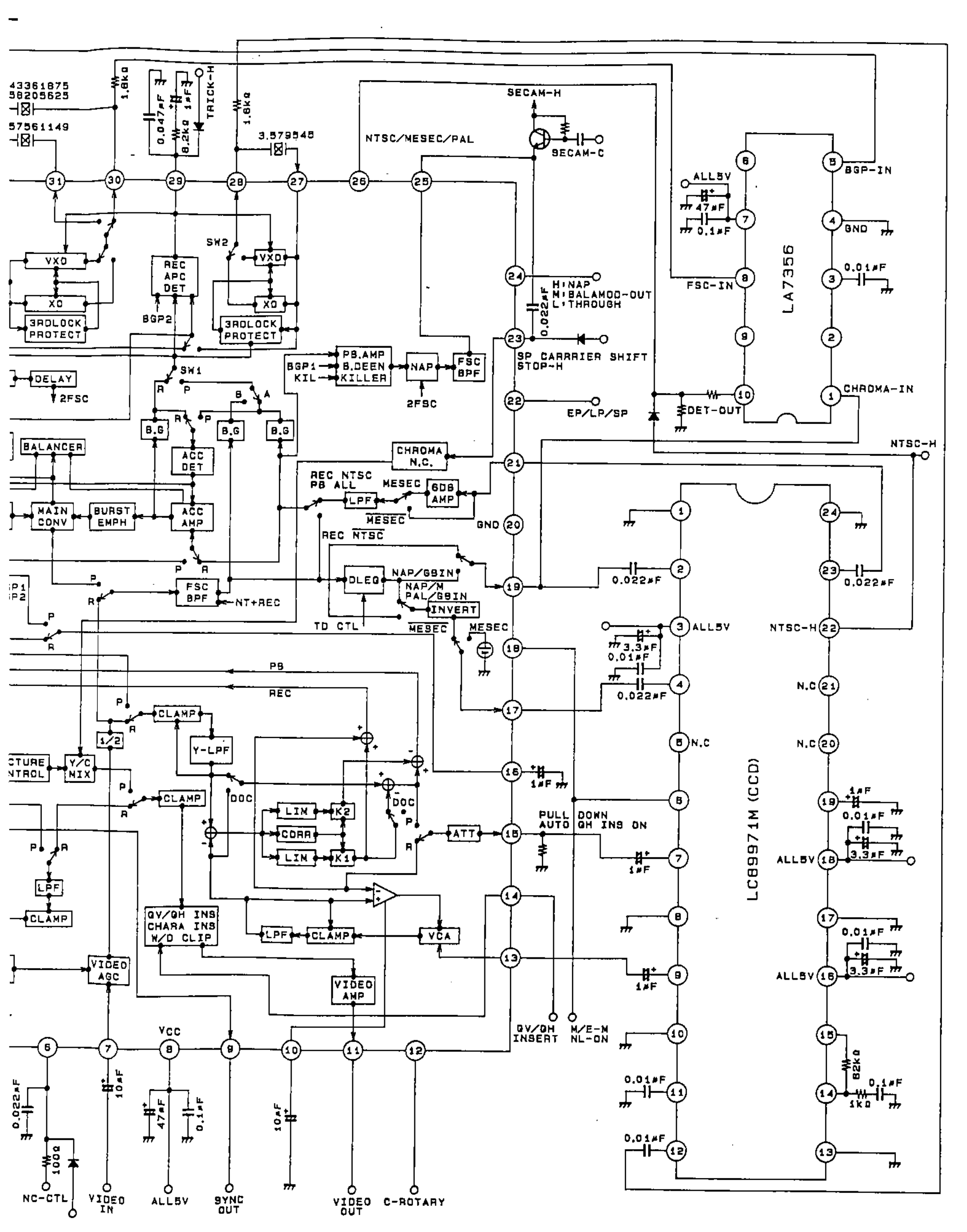




T26A
T28A
T25A
SW26A
1.8kΩ
3.9kΩ
3.579545
NTSC/MESEC/PAL
VXO
XO
3RDLOCK PROTECT
T24A
H:NAP
M:BALAMOD-OUT
L:THROUGH
SW24A
0.022μF
SW23A
SP CARRRIER SHIFT STOP-H
T23A
PB.AMP
B.DEEN
KILLER
BGP1
KIL
NAP
FSC BPF
2FSC
EP/LP/SP
T22A
SW22A
B.G
CHROMA N.C.
0.022μF
T21A
SW21A
REC NTSC PB ALL
MESEC
LPF
SDB AMP
GND
REC NTSC
T19A
DLEQ
NAP/GBIN
NAP/M PAL/GBIN
INVERT
0.022μF
-NT+REC
TO CTL
MESEC
M/E-M NL-ON
T18A
SW18A
ALL5V
NTSC-H
3.3μF
0.01μF
0.022μF
PB
REC
T17A
N.C
1μF
T16A
LC89971M (CCD)
DOC
LIN
K2
CORR
LIN
K1
ATT
PULL DOWN AUTO GH ING ON
SW15A
3.9kΩ
T15A
T14A
GV/GH INSERT
T13A
LPF
CLAMP
VCA
SW13A
1kΩ
VIDEO AMP
SYNC OUT
VIDEO OUT
C-ROTARY
10μF
100Ω
470μF
75Ω
82kΩ
0.1μF
T9A
T10A
T11A
T11B
T12A
SW12A
A03866

LA7440M Block Diagram





SECAM-H
SECAM-C
NTSC/MESEC/PAL
3.579545
TRICK-H
H:NAP
M:BALAMOD-OUT
L:THROUGH
SP CARRIER SHIFT
STOP-H
EP/LP/SP
BGP-IN
FSC-IN
GND
CHROMA-IN
DET-OUT
LA7356
NTSC-H
VXO
XO
3RDLOCK PROTECT
REC APC DET
SW1
SW2
BGP2
DELAY
2FSC
BALANCER
MAIN CONV
BURST EMPH
ACC DET
ACC AMP
B.G
FSC BPF
PB.AMP
B.DEEN
KILLER
NAP
BGP1
KIL
CHROMA N.C.
REC NTSC
PB ALL
MESEC
LPF
6DB AMP
DLEQ
NAP/GBIN
NAP/M
PAL/GBIN
INVERT
TD CTL
NT+REC
GND
CLAMP
Y-LPF
Y/C MIX
1/2
DOC
LIM
CORR
K1
K2
ATT
VCA
PULL DOWN
AUTO QH INS ON
QV/QH INS
CHARA INS
W/D CLIP
VIDEO AGC
VIDEO AMP
QV/QH INSERT
M/E-M NL-ON
VCC
NC-CTL
VIDEO IN
ALL5V
SYNC OUT
VIDEO OUT
C-ROTARY
N.C
LC89971M (CCD)
A03887